What Is Claimed Is:

1. A decoding method for demodulating a received signal available in serial code concatenation in a code-division multiple access transmission system, a two-step coding being carried out at the transmitting end of the transmission system, a first step of the two-step coding including a Hadamard orthogonal multi-step inner code, a second step of the two-step coding including an outer error-correcting code of a predefined rate, the method comprising:

providing a soft-in/soft-out decoder in a receiver of the transmission system, a first decoder step of the soft-in/soft-out decoder including an inner decoder, a second decoder step of the soft-in/soft-out decoder including an outer decoder; and

processing soft values as reliability information at an output and an input of the soft-in/soft-out decoder, a soft output of the inner decoder being a soft input for the outer decoder, a channel reliability information output from a preceding demodulation being an input for the inner decoder.

2. The method as recited in claim 1 wherein the inner code includes a 32-step modulation.

3. The method as recited in claim 1 wherein the inner code includes a 64-step modulation.

4. The method as recited in claim 1 wherein the outer code includes a convolution code.

5. The method as recited in claim 1 wherein the outer code includes a block code.

6. The method as recited in claim 1 wherein the reliability information includes L-values.

7. The method as recited in claim 1 wherein a soft input of the inner decoder includes a-priori information for systematic bits of Walsh functions of the inner code, the a-

priori information being useable by the inner decoder for decoding the inner code.

8. The method as recited in claim 7 wherein the inner decoder includes a maximum a-posteriori decoder.

9. The method as recited in claim 1 wherein to enhance reliability of decisions of the inner decoder, a soft output of the outer decoder is fed back as a soft input to the inner decoder as a-priori information for systematic bits of Walsh functions of the inner code.

10. The method as recited in claim 7 wherein the inner decoder includes a maximum a-posteriori decoder and wherein the a-priori information is made available to the inner decoder as reliability values in an a-priori vector $L(u)$ so that the inner decoder provides L-values for estimated symbols of an inner decoder soft value output vector $L(\hat{u})$, an amount $|L(\hat{u}_k)|$ of the L-values indicating a reliability of a respective decision and an operational sign of the $L(\hat{u}_k)$ representing a hard decision.

11. The method as recited in claim 9 wherein the inner decoder includes a maximum a-posteriori decoder and wherein the a-priori information is made available to the inner decoder as reliability values in an a-priori vector $L(u)$ so that the inner decoder provides L-values for estimated symbols of an inner decoder soft value output vector $L(\hat{u})$, an amount $|L(\hat{u}_k)|$ of the L-values indicating a reliability of a respective decision and an operational sign of the $L(\hat{u}_k)$ representing a hard decision.

12. The method as recited in claim 1 wherein the receiver includes a coherent receiver structure, wherein a soft input of the inner decoder includes a-priori information for systematic bits of Walsh functions of the inner code and wherein the inner decoder includes a maximum a-posteriori decoder, the maximum a-posteriori decoder calculating, starting from an input vector $L_C \cdot y$ having a specific reliability L_C and from an a-priori information vector $L(u)$, as a decoder result, a weighted decision including reliability L-values for estimated symbols, the L-values including an extrinsic term $L_e(\hat{u}_k)$.

13. The method as recited in claim 1 wherein the receiver includes a coherent receiver structure, wherein a soft input of the inner decoder includes a-priori information for systematic bits of Walsh functions of the inner code, and wherein the inner code includes a Hadamard code, the Hadamard code being decoded by:

adding an a-priori information vector L(u) for systematic bits of a Walsh function of the Hadamard code to an input vector $L_C{\cdot}y$ from a channel;

performing a fast Hadamard transformation so as to provide a fast Hadamard transform resultant vector w;

then generating exponential functions with $\frac{1}{2}{\cdot}w_j$ as an argument, w_j being a respective element of the vector w; and

adding, dividing and expressing logarithmically elements of a result vector z for each symbol $\hat{u}_K$ to be decoded according to the equation:

Term 1 Term 2

$$\ln\frac{\sum\limits_{j,u_k=+1}^{N-1} z_j}{\sum\limits_{j,u_k=-1}^{N-1} z_j} = \ln\frac{\sum\limits_{j,u_k=+1}^{N-1} \exp(\frac{1}{2}w_j)}{\sum\limits_{j,u_k=-1}^{N-1} \exp(\frac{1}{2}w_j)} = \ln\left(\sum_{j,u_k=+1}^{N-1} \exp(\frac{1}{2}w_j)\right) - \ln\left(\sum_{j,u_k=-1}^{N-1} \exp(\frac{1}{2}w_j)\right)$$

z_j being a respective element of the resultant vector z, j being a respective vector element index, N being a size of the Walsh functions of the inner code.

14. The method as recited in claim 1 wherein a result of the inner decoder for a bit $\hat{u}_k$ includes a-priori information $L(u_k)$ about a bit to be decoded, channel information $L_C{\cdot}y_{sys(k)}$ about the bit to be decoded, and extrinsic information $L_e(\hat{u}_k)$, channel information and a-priori information on all other bits of a demodulator output vector y or of a transmitted Walsh function of the inner code being included in the extrinsic information $L_e(\hat{u}_k)$.

15. The method as recited in claim 1 wherein the receiver includes an incoherent receiver structure and wherein the inner decoder includes a maximum a-posteriori decoder, the maximum a-posteriori decoder calculating, starting from a square-law-

combining fast Hadamard transform resultant decision vector w and from an a-priori vector L(u), as a decoder result, a weighted decision including the L-values for estimated symbols, the L-values including an extrinsic term $L_e(\hat{u}_k)$.

16. The method as recited in claim 1 wherein the receiver includes an incoherent receiver and wherein the outer decoder includes a maximum a-posteriori decoder, the soft output of the inner decoder including a-priori information for systematic bits of Walsh functions of the inner code useable for decoding of the inner code.

17. A decoding device for demodulating a received signal available in serial code concatenation in a code-division multiple access transmission system, a two-step coding being carried out at the transmitting end of the transmission system, a first step of the two-step coding including a Hadamard orthogonal multi-step inner code, a second step of the two-step coding including an outer error-correcting code of a predefined rate, the device comprising:

a soft-in/soft-out decoder disposed in a receiver of the transmission system, a first decoder step of the soft-in/soft-out decoder including an inner decoder, a second decoder step of the soft-in/soft-out decoder including an outer decoder, soft values being processed as reliability information at an output and an input of the soft-in/soft-out decoder, a soft output of the inner decoder being a soft input for the outer decoder, a channel reliability information output from a preceding demodulation being an input for the inner decoder.

18. The device as recited in claim 17 wherein the inner code includes a 32-step modulation.

19. The device as recited in claim 17 wherein the inner code includes a 64-step modulation.

20. The device as recited in claim 17 wherein the outer code includes a convolution code.

21. The device as recited in claim 17 wherein the outer code includes a block code.

22. The device as recited in claim 17 wherein the reliability information includes L-values.

23. The device as recited in claim 17 wherein to enhance reliability of decisions of the inner decoder, a soft output of the outer decoder is fed back as a soft input to the inner decoder as a-priori information for systematic bits of Walsh functions of the inner code.

24. The device as recited in claim 17 further comprising a RAKE receiver disposed upstream from the inner decoder, an output of the RAKE receiver including the channel reliability information output from the preceding demodulation.